

U.S. Patent Application Serial No. 10/574,274
Amendment filed April 16, 2009
Reply to OA dated December 17, 2008

REMARKS

Claims 1-4 are pending in this application. Claims 5-8 are newly added herein. Upon entry of this amendment, claims 1-8 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is as follows.

Support for new claim 5 may be found in the process conditions for Examples 1-3 of the present specification.

Support for new claim 6 may be found in the process conditions for Examples 4-6.

Support for new claim 7 may be found in the process conditions for Example 7.

Support for new claim 8 may be found in the process conditions for Example 8.

Claims 3-4 are rejected on the ground of nonstatutory double patenting over claims 1-2 of U.S. Patent No. 7,442,250 (hereafter US '250) since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent. (Office action p.2)

The rejection is obviated by the filing of a terminal disclaimer over U.S. Patent No. 7,442,250. The terminal disclaimer papers are filed concurrently with this Amendment.

Claims 1-2 are rejected under 35 U.S.C. §102(b) as being anticipated by Bordui et al. WO 01/33260 A1 (hereafter WO '260). (Office action p. 3)

The rejection of claims 1-2 is respectfully traversed, and reconsideration is requested.

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Applicant notes that WO 01/33260 A1 is a counterpart application to Japanese Patent Application Laid-open No. H11-92147, which was cited in the Information Disclosure Statement filed on March 31, 2006, and has the same general disclosure as JP H11-92147. JP '147 is discussed in the present specification at page 4, line 21, to page 5, line 22, as follows:

"Accordingly, in order to solve such problems, as disclosed in Japanese Patent Applications Laid-open No. H11-92147 and No. H11-236298, it is proposed to expose a lithium niobate (LN) crystal to a reducing atmosphere (stated specifically an atmosphere of a gas selected from argon, water, hydrogen, nitrogen, carbon dioxide, carbon monoxide, oxygen, and combination of any of these) in the range of 500 to 1,140°C to blacken a wafer of LN crystal so that the substrate can be kept from having a high light transmittance and also can have a high electrical conductivity to thereby keep the light from returning from the substrate at the same time make the substrate have a low pyroelectricity.

However, the invention disclosed in the publications Japanese Patent Applications Laid-open No. H11-92147 and No. H11-236298 is intended not only for the LN crystal but also the lithium tantalate (LT) crystal, but these publications Japanese Patent Applications Laid-open No. H11-92147 and No. H11-236298 have substantially no disclosure at all as to the LT crystal. Then, experiments made by the present inventors have confirmed that **the method disclosed therein is effective in respect of the lithium niobate crystal, having a melting point of as low as about 1,250°C, but not effective in respect of the LT crystal, having a melting point of as high as 1,650°C.**" (emphasis added)

More specifically, WO '260 (counterpart to Japanese Patent Application Laid-open No. H11-92147) merely discloses a conventional control method by which a lithium niobate (LN) crystal is exposed to a reducing atmosphere (an atmosphere of a gas selected from argon, water, hydrogen, nitrogen, carbon dioxide, carbon monoxide, oxygen, and combination of any of these) (see page 6, lines 26-29) in the range of 500 to 1,140°C (see page 7, lines 5-6) to reduce a wafer of LN crystal so that the substrate can be kept from having a high light transmittance and also it can have a high

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electrical conductivity of thereby keep the light from returning from the back of the substrate and at the same time make the substrate have a low pyroelectricity.

That is, as discussed in the present specification, WO '260 merely discloses an invention which is effective in respect of a lithium niobate (LN) crystal, which has a low melting point, but not effective in respect of an LT (lithium tantalate) crystal, which has a melting point of as high as 1,650°C. This fact is demonstrated in Comparative Examples 1-3 on pages 20-22 in the present specification.

Moreover, Table 1 (page 10) of WO '260 shows that the surface resistivity (Ω unit) of lithium niobate (LN) ranges from about $10^8 \Omega$ to $10^{14} \Omega$, but there is no disclosure in WO '260 of the lithium tantalate substrate having volume resistivity ($\Omega \cdot \text{cm}$ unit) which has been "controlled within the range of from more than $10^8 \Omega \cdot \text{cm}$ to less than $10^{10} \Omega \cdot \text{cm}$ " as recited in present claim 1.

Thus, there is no teaching or suggestion in WO '260 for the lithium tantalate substrate recited in present claims 1-2. The invention of present claims 1-2 is therefore not anticipated by Bordui et al. WO '260.

Claims 1-2 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bordui et al. WO 01/33260 A1 (hereafter WO '260) in view of Furukawa et al. JP 63-35499 A (hereafter JP '499). (Office action p. 5)

The rejection of claims 1-2 is respectfully traversed, and reconsideration of the rejection is requested. In traversing the rejection, Applicant submits the following points:

- (1) The invention of JP '499, as recited in claim 1 of the reference, reads:

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“a method for **single-poling a multi-poled crystal of lithium tantalate** by burying in a powder the multi-poled crystal in full or only in a portion to be single-poled, inserting electrode plates in the powder at its regions opposed to a direction in which an electric field is applied to the multi-poled crystal, applying an electric field between the electrode plates nearly at a Curie temperature, followed by gradual cooling, wherein ...” (emphasis added).

Thus, the invention disclosed in JP '499 is directed to single-poling treatment of the lithium tantalate crystal, but differs from the process of the present invention where the volume resistivity of a lithium tantalate substrate is controlled.

(2) Additionally, on page 544, lower right column, lines 4-8, JP '499 describes that: “The powder constituent materials include, for example, lithium niobate, lithium tantalate, conductive **sialon**, zirconia, titania, etc. Those constituent materials which have properly been controlled in respect of electric resistivity at high temperature can be used” (emphasis added). On the ground of this description, the Examiner considers that JP '499 discloses use of alumina. However, there is no disclosure of alumina here. The term “sialon” is the generic designation for a solid solution of an Si-Al-O-N type compound and does not mean a powder containing alumina.

(3) As discussed above, JP '499 merely describes single-poling treatment of a lithium tantalate crystal by using “sialon” as a powder constituent material, but does not disclose a process in which a lithium tantalate crystal worked in the state of a substrate is buried in a mixed powder of Al and Al₂O₃ to thereby control the volume resistivity of this substrate.

(4) Further, the lithium tantalate substrate recited in present claims 1-2 is not disclosed in WO '260, as discussed above.

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Consequently, the teachings of WO '260 A1 and JP '499 cannot be combined to construct present claims 1-2. The invention of present claims 1-2 is therefore not obvious over these references, taken separately or in combination.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Petition for Extension of Time
Amendment Fee Transmittal
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